BERKELEY LAB

LAWRENCE BERKELEY NATIONAL LABORATORY

U.S. DEPARTMENT OF ENERGY

Reheat In Existing Lab Buildings

Minimizing Simultaneous Heating and Cooling

Better Buildings Alliance

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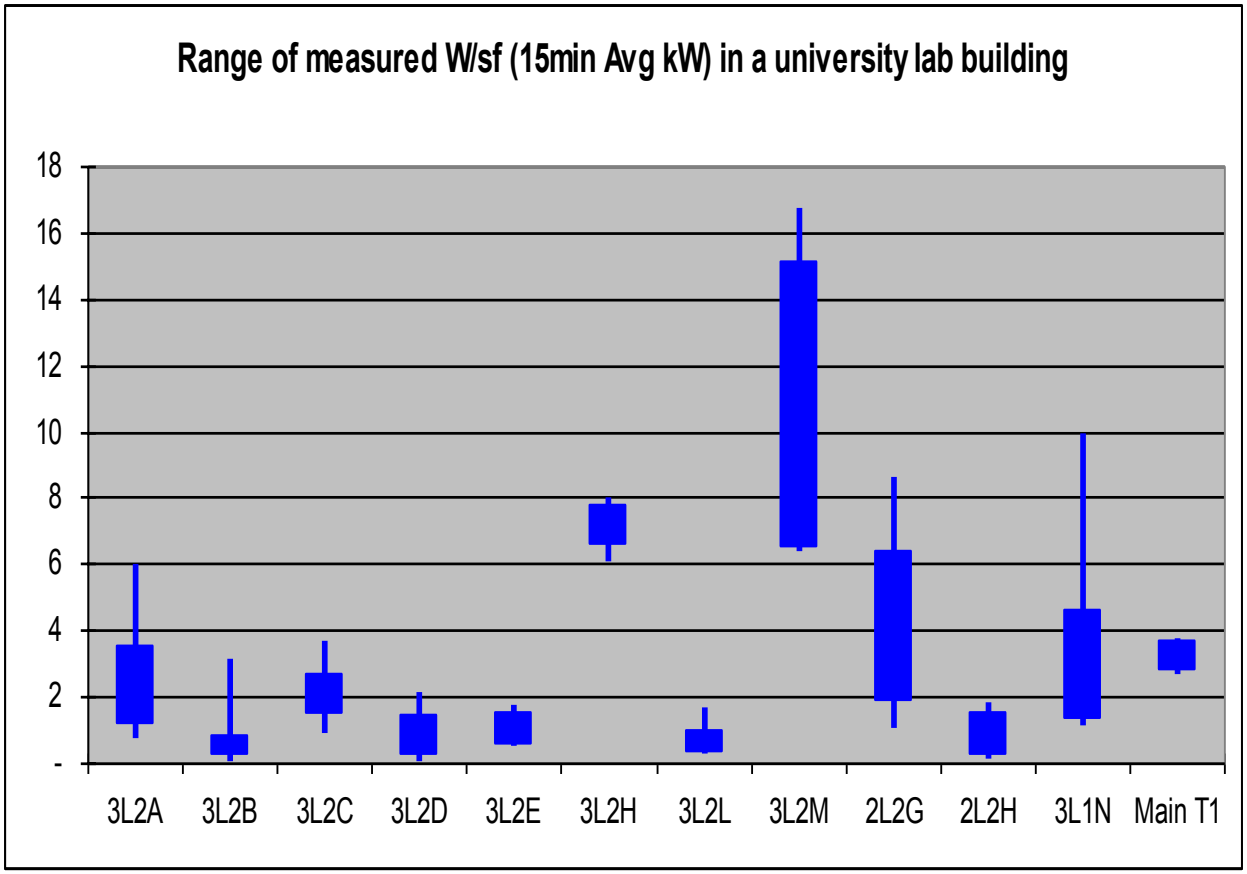
What is simultaneous heating and cooling? Reheat?

- First cooling the air, then heating it up again
  - Humidity control
  - Temperature control
- Can be variable or constant volume

See the Labs21 best practice guide on minimizing reheat http://www.i2sl.org/documents/toolkit/bp_reheat_508.pdf

Load variation causes excessive reheat



Highly loaded space forces the supply air temperature down, causing other spaces to reheat (excessively).

Does my building have reheat?

Check with facilities personnel

Look at DDC graphic screens

- Cooling at the AHU
- Heating at the zone with hot water or electric coil

Read control sequence of operation

- “Reheat coil” or “terminal heating coil” for zone temperature control

How do I know if reheat is minimized?

Necessary : at least one zone should have its VAV box wide open (effective “Worst Zone Reset”)

- in labs, supply or exhaust depending on which is temperature controlled

True minimization is more involved—see later

Quantifying reheat

Heating:

If VAV box airflow and temperatures of supply air from AHU and discharge air from the box are available:

BTU/hr = 1.08 x cfm x (SAT-DAT)

Then use DDC trending to sum the zones.

For plant energy, input is the zone total BTU divided by the plant efficiency (ca. 80% for conventional boiler, 90% for condensing).

Excessive reheat = “before” – “after” minimization

Quantifying reheat, con't

Excessive cooling:

Excessive cooling BTU is equal to the excessive reheat less free cooling (OAT < SAT).

For cooling plant energy, input is the total excessive reheat (converted to ton-hours) divided by the plant efficiency (in kW/ton, typically between 0.5 and 1 for water-cooled plants) resulting in kWh.

Strategies to Minimize Reheat

If one zone isn't wide open:

- Is worst-zone reset present in programming?
- Is WZR enabled (no over-rides)?

Track the worst zone(s): why are they driving?

- Check controls for proper operation
- Can maximum airflow setpoint be increased?
- Can cooling temperature setpoint be increased?
- Can cooling loads be reduced?
- Can minimum airflow setpoint be decreased?

Strategies to Minimize Reheat, con't

Add auxiliary cooling to hot spaces

- Bigger or more boxes
- Chilled or process cooling water fan coils
- Ductless split AC

Reduce air-change rates

- Saves fan, heating, and cooling energy
- Reduces the fraction of reheat energy (fewer spaces over-ventilated)

If there are general exhaust (GX) dampers, allow more rather than colder air in high-load zones by either

- GX controlled by temperature, supply by pressure
- GX controlled by pressure, supply by temperature

Example: LBNL Molecular Foundry RCx

- Programming errors in the Worst Zone Reset
- Operator over-rides of the programming
- Faulty hot water valves
- Stuck terminal unit (VAV box) dampers
- “Rogue” zones with undersized boxes or duct problems
- Bad sensors in AHU doing humidity control
- Bad temperature sensor in zone
- Bad flow sensor in zone
- Pressure controller problems

Questions

Have you analyzed reheat energy use in your labs?

- Do you continuously track reheat in your labs?

Have you made efforts to minimize reheat?

- What strategies have you used?
- What savings have you achieved?